Liquid Argon Test Facility (LArTF) Hazard Awareness Training Handout

(PDLAR001/CB/01)

Version 1.0
Date 07/21/2014

Overview

The installation phase of the MicroBooNE experiment presents many hazards. This document is intended to inform you of the potential hazards you may encounter in the LArTF and the proper precautions to take to prevent unsafe situations. Please read the entire document, complete the quiz, then sign and submit the signature sheet at the end. This hazard awareness training is mandatory for all personnel who enter LArTF or work at LArTF routinely. It is valid for one year.

1. Introduction

This training document outlines the hazards specific to the LArTF and the MicroBooNE experiment.

Upon entering the building, always check the whiteboard (located on the loading dock) for the daily activities and hazards. If you may be creating any hazards with your work, inform the installation/commissioning coordinator (or designee) so that this information can be included on the whiteboard.

If you find a situation in which you need advice, training, review or a decision in regards to safety or safe operations, you should first go to your immediate supervisor/spokesperson. If you and your supervisor/spokesperson conclude that the matter goes beyond your own group, that you need assistance in resolving it, or that you need to arrange for safety training, you should contact a member of Particle Physics Division (PPD) ES&H: http://www-ppd.fnal.gov/eshbmgOffice/contacts.html. In the event of an emergency, you should call ext. 3131 from any Fermilab telephone.

Environmental Safety, Health & Quality (ESH&Q) materials referenced in this document can be consulted for guidance on ESH&Q issues. These materials can be found on-line at this URL: http://esh.fnal.gov/xms/

1.1. Programs for Controlling Hazards

The programs for controlling the hazards that may be found within the facilities generally have three parts: (1) reviews to minimize hazards of new systems; (2) personnel training; and (3) documented operating and safety procedures or guidelines to follow. In addition, work activities performed by Fermilab employees shall be reviewed via a Job Hazard Analysis (JHA) before work is started (see Chapter 2060 of the Fermilab Environmental, Safety, and Health Manual (FESHM)). Reviews to minimize hazards in the design, construction, and operation of new systems are conducted by specific review committees or Environmental, Safety, and Health (ES&H) personnel. If you are involved in an operation that you feel should be reviewed, contact your supervisor or the installation coordinator/spokesperson. Training courses are conducted by supervisors, the PPD ES&H Group, or the Fermilab ESH&Q Section, depending on the specific need. Written procedures and job hazard analyses are usually developed by those doing the work and their supervisors, in consultation with ES&H personnel when necessary.

2. Electrical Hazards

Many components utilize potentially dangerous high voltages and/or currents. In addition, certain electrical devices/components may retain significant electric charge after their high-voltage sources are removed. These sources of energy can cause electric shock to personnel if work on these devices is carried out improperly. All personnel are required to have Electrical Safety Orientation [FN000387] Training, which is a brief orientation to the Fermilab Lockout/Tagout (LOTO) program and NFPA-70E for unqualified workers. People performing service or maintenance work on or near equipment that could cause them injury if it were to become energized must lockout and tagout that equipment's energy source(s) and must have current Fermilab LOTO Level 2 [FN000212] Training.

Only LOTO Level 2 trained personnel are authorized to work on equipment that could become hazardous to them if that equipment were unexpectedly energized. LOTO requires the use of a designated red lock and a DANGER tag to isolate the hazardous stored energy source (e.g., electricity, gravity, springs). Additional information about LOTO can be found in the FESHM Chapter titled “Fermilab Energy Control Program (Lockout/Tagout).”

NOTE: The term "configuration control" applies to the lockout and tagging of equipment that could not jeopardize worker safety. The application of "configuration control" locks does not require LOTO Level 2 Training or procedures and should be implemented with a (non-red) padlock and a CAUTION tag.

A common hazard is 'daisy-chaining' of extension cords and power strips. Extension cords and power strips are designed to be used individually and not connected to others in series. Such improper installations can become a fire hazard by creating an over-current condition. Figure 1 shows examples of acceptable and unacceptable usages of extension cords and power strips. These are examples of configurations found onsite at Fermilab, however acceptable and unacceptable configurations are not limited to the examples. Contact the building manager, installation coordinator or PPD ES&H if you have any questions.

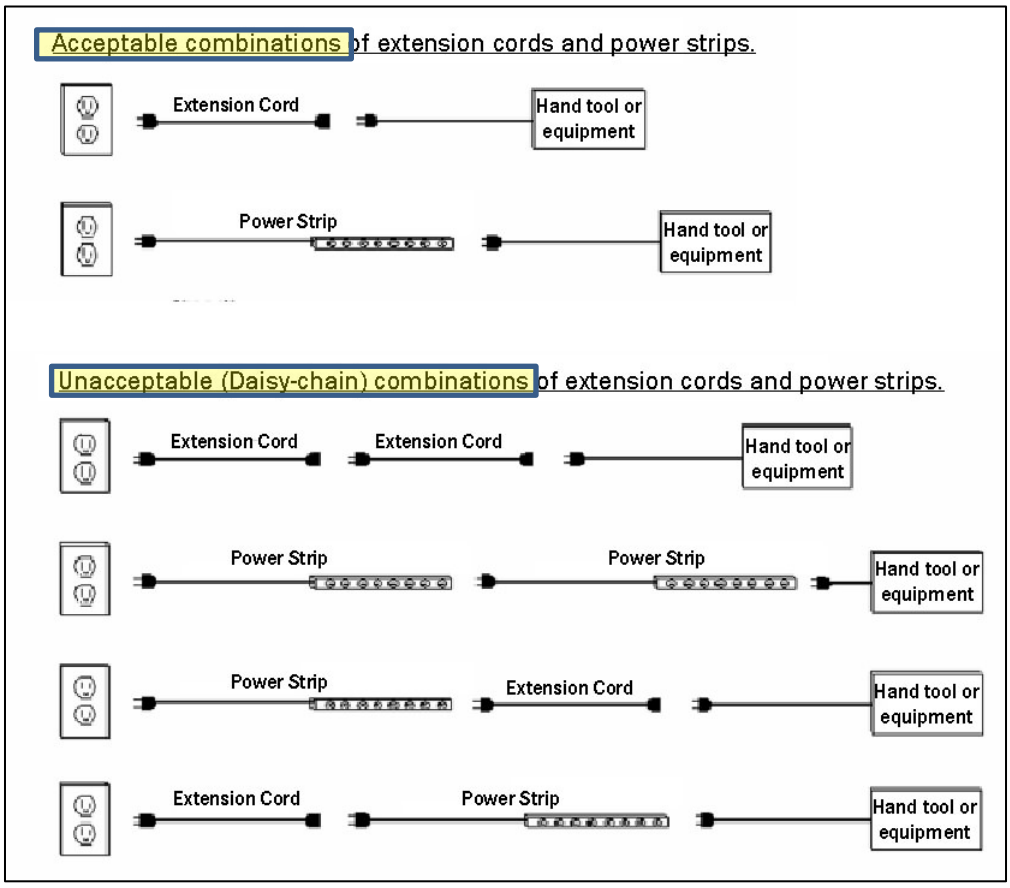

Figure 1. Examples of Acceptable and Unacceptable Extension Cord and Power Strip Combinations.

3. Radiation Hazards

A facility may contain areas where radiation hazards can be found. Radiation fields can also be found near activated objects and radioactive sources. Radiation dosimeter badges are required when working with radioactive sources and in any posted radiation area. Temporary badges are available from the Communications Center (on the Ground Floor of Wilson Hall, ext. 4251). Permanently-assigned badges are located on badge racks in the facility. Quarterly radiation dose reports for people who have permanently assigned badges can be obtained through your local Radiation Safety Officer (RSO). Refer

to Table 1 for entrance and exit requirements for the different posted areas. Be aware that some areas may require General Employee Radiation [FN000241] Training (GERT), Radiological Worker – Classroom [FN000470] Training (including Radiological Worker – Practical Factors [FN000471] Training), and/or Radioactive Source [FN000048] Training.

Table 1. Requirements for Different Posted Areas.

	Requirements for Entrance	Requirements for Work with Radioactive Materials or Radioactive Sources
Controlled Area	·GERT	·Radiological Worker Training ·Radioactive Source Training
Radioactive Material Area	·GERT ·do not handle any radioactive material	·Radiological Worker Training ·Radioactive Source Training
Radiation Area	·Radiological Worker training ·signature on RWP (as appropriate) ·dosimetry badge	·Radioactive Source Training

All items removed from posted areas are assumed to be radioactive and must be checked for radioactivity by the person(s) removing them. In addition, potentially activated or contaminated items must be surveyed by an authorized person prior to being taken off the Fermilab site. Contact the PPD RSO to request such a survey.

If a female radiological worker knows or suspects that she is pregnant, she can notify the Fermilab Medical Office in writing and consult with the Occupational Medical Director and a radiation safety staff member to discuss options for minimizing her prenatal radiation exposure. This notification is voluntary and can be arranged with the assistance of the PPD RSO. Further information regarding Fermilab standards for radiological work can be found in the Fermilab Radiological Control Manual.

Specific Radiation Hazards at the LArTF:

LArTF is located along the Booster Neutrino Beam (BNB). The beam neutrinos and interactions resulting from them do not pose a radiation hazard and LArTF is not a radiation area when the BNB is operating. There are no sources or source box located at LArTF. GERT is the only radiation safety training required for entry.

4. Chemical Hazards

Small amounts of chemical materials, such as epoxies and solvents, are used or stored in certain areas. If handled incorrectly, some of these materials may become harmful. As a general practice, the use of combustibles should be limited. All hazardous (e.g., flammable, corrosive, reactive, or toxic) materials that are not in use must be stored in specially designated cabinets. Flammable liquids, such as acetone, must be stored in a Flammable Liquids Cabinet. Figure 2 shows an example of a Flammable Cabinet. Rags or Kim Wipes used in the application or cleanup of solvents must be collected in flammable rag containers and must be emptied every night.

Safety Data Sheets (SDS's) containing information on all of these and other materials within the facility can be found online at http://www-esh.fnal.gov/pls/ip/msds_search.html. Additional information regarding chemical hazard communication is outlined in FESHM Chapter titled "Hazard Communication."

Figure 2. Example of a Flammable Cabinet.

5. Environmental Hazards

An accidental release of some materials (e.g., oil, gasoline, diesel fuel) from certain equipment could become harmful if it is not promptly contained. Such a release can be considered harmful if it can potentially cause adverse effects to people or the environment. If you know or suspect that such a release has occurred or will occur, call ext. 3131 to report a spill emergency. Designated personnel are trained to execute procedures designed to minimize the spread of accidentally released materials. In addition, the following materials are prohibited from disposal in trash cans and dumpsters:

- all hazardous (e.g., flammable, corrosive, reactive, toxic) materials
- degreasing agents (e.g., Freon)
- uncured epoxy
- ethylene glycol ("anti-freeze")
- fluorescent light bulbs
- oils
- paints
- pesticides
- radioactive material, radiation signs and labels
- scrap metal
- NiCad, lead/acid, and lithium batteries
- any free liquids (regardless of chemical nature)

Contact PPD ES&H personnel for information regarding the proper disposal of such items. Whenever possible, please recycle rather than throw away materials that are no longer of use.

6. Hazards Associated with Operating Machinery

6.1. Cranes and Forklifts

Improper use of certain equipment, such as cranes and forklifts, can endanger people working in the area as well as material being moved. People operating cranes and forklifts must complete operator training and renew this training every three years. Operators must warn others of approaching loads. All

personnel are prohibited from the area near or under any suspended load. Procedures for crane use can be found in the FESHM.

Specific Hazards Associated with Cranes and Forklifts at the LArTF

When the overhead crane is in use to load/unload materials, crane operators are responsible for clearing personnel from the area of the lift. Hard hats and safety shoes are required whenever involved in an overhead lift, or in the vicinity of an overhead lift.

6.2. Power Tools

Machines in this area present hazards due to moving parts. Power tool operations present similar hazards. Work with some tools and equipment requires the use of Personal Protective Equipment (PPE). Any loose clothing or jewelry that might become entangled must be removed prior to operating these machines. Hair that might become entangled should be covered or tied back. All hammering, drilling, cutting, grinding, and power tool operations require the use of protective eyewear (e.g. safety glasses or goggles) with side shields that fit snugly to the face. In addition to glasses or goggles, grinding operations also require the use of a full-face shield. Some operations may require other forms of PPE (e.g., hearing protection, gloves). Manufacturer's recommended operating instructions are a good source of information on how to operate equipment safely.

6.3. Aerial and Scissor Lifts

Aerial lifts are devices used to elevate personnel to sites above ground, which use articulating or extensible boom platforms. Scissor lifts are mobile supported scaffolds, which can be powered or unpowered.

Improper use or poor maintenance of either aerial or scissor lifts can pose a serious safety hazard. PPD employees and users who will utilize aerial/scissor lifts will receive training on the proper operating procedures, and hazards associated with the equipment and operating the equipment.

Specific Hazards Associated with Aerial and Scissor Lifts at the LArTF:

Hard hats are required whenever working in an area where lifts are in use. Fall protection is required when working from aerial lifts (boom or articulating). Only individuals who have completed Fall Protection Orientation training [FN000304] may use fall protection equipment.

7. Hazards Associated with Working at Heights

There are unusual places throughout the facility from which people or things have the potential to fall. These include ladders, scaffolds, personnel (aerial and scissor) lifts, etc. The physical condition of ladders and scaffolds should always be inspected prior to their use and must be used in accordance with all posted instructions and/or safety precautions. Personnel lifts are available in some areas for workers trained in their use. Work from elevated platforms that have no railings requires Fall Protection Orientation [FN000304] Training, the use of a body harness and lanyard, and a written rescue plan in the hazard analysis. Hard hats must be worn whenever someone is working above you or during rigging activities.

It is common for work to be conducted at elevations above floor level. When working with ladders, a number of rules apply:

- Always use the appropriate ladder for the job. Avoid reaching or leaning from a ladder to complete a task.

- When ladders are not in use, they must be stored in a secure location that will not cause an obstruction to walkways or workspaces.
- The physical condition of ladders and scaffolds should always be inspected prior to use and must be used in accordance with any posted instructions and/or safety precautions.

Specific Hazards Associated with Working at Heights at the LArTF:
Any ladder use on the surface or platform levels where the ladder is placed within a ladder-height distance of any guardrail must be used with fall protection.

Access to the built-in lower ledge of the platform is made by lifting out platform decking panels and stepping down. The lower ledge has toe-kicks and guardrails; fall protection is not required.

For access below the platform away from the built-in lower ledge, two "drop boxes" have been constructed. These are structures which fit into the space covered by a single decking panel and provide a small lower level to step down onto so one may more easily reach items and spaces just below the platform. The drop box must be positioned using the building's crane. A tie-off is available above the drop box for fall protection, which is required when either of the guardrails are removed.

Only individuals who have completed Fall Protection Orientation training [FN000304] may use fall protection equipment.

8. Hazards Associated with Compressed Gas and Pressure Vessels

Many facilities contain systems and operations that utilize compressed gases and pressure vessels that may become hazardous if ruptured or handled improperly. All gas cylinders must be properly regulated while used and capped while stored. They also must remain protected from falling down at all times, for example by securing them to a storage rack or other solid object. Only trained personnel should handle compressed gasses. You can find the Fermilab Compressed Gas Training [FN000213] here: http://www-esh.fnal.gov/pls/default/class_sched.html. Additional requirements and procedures regarding compressed gas systems and pressure vessels can be found in FESHM.

Specific Hazards Associated with Compressed Gas and Pressure Vessels at the LArTF:
The MicroBooNE detector vessel is an ASME-stamped pressure vessel, and the supporting cryogenics system contains additional pressure vessels located in the pit level and at the surface outside of the loading dock. Compressed gas is also stored outside.

9. Emergencies

Call ext. 3131 in the event of an emergency situation, such as personnel requiring medical treatment for any reason. Stay on the phone until the emergency operator indicates that s/he has all of the necessary information, including your name, location and nature of the emergency. Do not attempt to bandage another person or clean any bodily fluids from another person's injury.

When evacuating any area, proceed to the designated assembly point and wait there until the 'all clear' signal is given. If you must leave and can't wait for the 'all clear', tell your supervisor or an Emergency Warden. Rescue attempts will be made by the Fire Department if someone is unaccounted-for and believed to be in an unsafe area (e.g., burning structure, oxygen deficient area). If you notice that a

fellow worker is missing during an emergency, immediately report this to an Emergency Warden, the Incident Commander (Fire Dept.) or the Fire Chief.

9.1. Steady Alarm

This is a fire alarm and it means that smoke or fire has been detected in the area.

Specific Procedures for a Steady Alarm at the LArTF:

Upon activation of the fire alarm, immediately evacuate the building and gather at the emergency assembly area, located in the parking lot near the MiniBooNE enclosure.

9.2. Whooper Alarm

This is a hazardous atmosphere (i.e., ODH) or interlock alarm.

Specific Procedures for a Whooper Alarm at the LArTF:

Upon activation of the ODH alarm, immediately evacuate the building and gather at the emergency assembly area, located in the parking lot near the MiniBooNE enclosure.

9.3. Sitewide Emergency Warning System (SEWS)

This is a verbal communication system broadcast throughout all areas of the laboratory. It is used to notify personnel when hazardous conditions exist and what protective actions to take. It is very important that you respond to its warning tones and messages and that you follow the transmitted instructions. If the nature of the message indicates severe weather, promptly go to the designated shelter for your area.

Specific Procedures for a SEWS Message at the LArTF:

Upon notification of a severe weather threat, follow directions to move into the designated shelter, which is located at the bottom of either of the stairwells of LArTF. To access while the gate is closed, use the emergency key in the glass-fronted key box (breaking the glass with the provided tool). If already on the pit or platform level, move into the stairwells and get to the lowest level. Remain there until an all-clear is given.

9.4. Fire Suppression System

LArTF utilizes an automatic sprinkler system. Manual pull stations are located at building exits (use in the event that the alarm system has not activated but signs of fire are present). Smoke detectors are also located throughout the building.

10. Cryogenic Hazards

There may be areas within the facility where cryogens such as liquid nitrogen or argon may be routinely present. A leak of these materials can cause local zones of oxygen deficiency. In addition, there may be areas where acute physical hazards associated with handling cryogenic materials, such as burns to the eyes and skin, are present. When cryogenic materials are handled, appropriate PPE, such as gloves and protective eyewear with side shields, must be worn. Additional information regarding the controls and procedures required of cryogenic and ODH areas are contained in the FESHM.

Specific Cryogenic Hazards at the LArTF:

Once the cool-down and filling process begins, and during operations, the pit and platform levels have an ODH-1 rating. The surface level has an ODH-0 rating at all times. In general operation of the

cryogenics system does not involve the handling of cryogens – contractors handle the delivery of liquid nitrogen and liquid argon to the designated storage dewars located outside the building.

Leaks in valves or other connections may occur, particularly during the initial commissioning; such leaks can show as a persistent fog. If such a fog is observed, all those in LArTF must exit and the cryogenics support group informed of the problem.

11. Confined Spaces and Limited Access Areas

Confined spaces are locations in which hazards, such as poor illumination, difficult emergency escape and ODH, can be intensified. A written permit and Fermilab Confined-Space [FN000003] Training is required for access to any confined space. Additional policies and procedures regarding access to confined spaces can be found in the FESHM chapter titled "Confined Spaces."

Specific Confined Spaces and Limited Access Areas at the LArTF:

Access to the ODH-1 areas (pit and platform levels) after the vessel has been filled requires ODH training [FN000029]. Access is controlled via locked gates in the stairwells to the platform and pit levels. Keys to the gates are available from a key tree located on the LArTF surface level. The key tree can be opened remotely from an operations coordinator in the Experimental Operations Center, or opened locally by use of a keypad code; in either case, the person(s) requesting access will be verified as having completed ODH training before access is granted.

The LArTF sump pit is a confined space and requires a confined space permit in order to enter. Contact PPD ES&H for permit approval.

12. Miscellaneous

The following describes some additional general hazards and work rules which exist within the facilities:

- Smoking at facilities is permitted only outdoors and at least 15 ft. from the nearest indoor entrance.
- All new visitors working at Fermilab must register with the Users' Office (WH1E, ext. 3111) upon their arrival.
- It is always preferred that people not work alone. When this is impractical, workers should at least ensure that another person, such as their supervisor/spokesperson, is aware of when and where they are working, and they should make arrangements to periodically check-in with that person. This is especially important for work during off-hours. Also note that for some types of jobs, explicit "two-man rule" requirements may exist.
- **Nothing** must be attached to or suspended from overhead sprinkler pipes.
- Since janitorial personnel do not service LArTF, you must clean up after yourself.
- Keep the roll-up door closed as much as possible to prevent stressing the Heating, Ventilation and Air Conditioning (HVAC) system.
- Proper PPE must be worn for various situations. Closed toed shoes are required at all times when in LArTF. Hard hats must be worn when working in the pit or on the platform level.

13. LArTF Hazard Awareness Quiz

Name: _____ ID#: _____ Date: _____

1) Who is required to complete this training?
   a) All Fermilab employees
   b) All visitors
   c) Anyone who routinely works at LArTF
   d) Both a & b

2) What actions should you take if you hear the tornado alert or sirens?
   a) Go outside to look for signs of tornadoes
   b) Take cover in the emergency shelter (the stairwells of LArTF)
   c) Curl into the fetal position and cry
   d) Get in your vehicle and drive home

3) What is the FIRST thing you should do if you hear a fire alarm at LArTF?
   a) Call the Fire Department
   b) Investigate if there is really a fire
   c) Evacuate the building and gather in the parking lot by MiniBooNE
   d) Call your supervisor/spokesperson

4) What personal protective equipment (PPE) is required when working in the vicinity of an overhead lift?
   a) Hard hat
   b) Safety shoes
   c) Face shield
   d) Safety glasses
   e) Both a & b

5) Who should you contact for information about proper disposal of hazardous or unknown chemicals?
   a) The building manager
   b) PPD ES&H personnel
   c) Your colleague
   d) No one, just throw them out
   e) Both a & b

6) It is acceptable to plug one electrical extension cord into a multiple outlet strip (power strip).
   a) True
   b) False

7) What should you do in the event any person requires medical treatment?
   a) Panic
   b) Call the building manager
   c) Call the Main Control Room
   d) Call extension 3131
   e) Treat the person with a first aid kit

8) Where can you store a flammable liquid (e.g. ethanol, acetone) overnight?
   a) In a special cabinet designated for flammable liquid storage
   b) Anywhere, as long as it's labeled
   c) It's ok to leave in your work area
   d) In a toolbox
   e) Both C & D

9) Which of the following actions requires specific training prior to being performed?
   a) Work on equipment that could become hazardous if the equipment were unexpectedly energized (LOTO 2)Operation of cranes, forklifts or manlifts (Operator Training)
   b) Handling of compressed gases (Compressed Gas Cylinder Safety)
   c) Work from elevated platforms (Fall Protection Orientation)
   d) All of the above

10) What should you do if you find an unsafe situation?
   a) Stop work immediately and inform your supervisor or ES&H personnel
   b) Ignore it
   c) Curl into the fetal position and cry
   d) Immediately inform the Fire Department
   e) None of the above

14. Signature Page and Training Record

"I have read the **LArTF Hazard Awareness Training Handout** and understand the hazards present within the facility. Also, I agree to follow all of the listed work rules and emergency procedures."

Print your name: _____Fermilab ID#: _____

Division/Section/Affiliation: _____Department/Group: _____

Fermilab Phone #: _____ Mail Station: _____

Email address: _____

Your signature: _____

Today's Date: _____

If you have not completed this training online, please complete the quiz and this form and return both to:

LArTF Hazard Awareness, MS 355
OR
Fax 630-840-8602

----------FOR ADMINISTRATIVE USE ONLY----------

Course: LArTF Hazard Awareness Training (PDLAR001/CB/01)

Quiz score: _____/10 (score < 8 = fail)

TRAIN group assignment: _____

Authorization: _____
(Must be signed by PPD ES&H personnel)